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(54) Improvements in or relating to locking apparatus

(57) The device for a transport container comprises a cast iron assembly in which a shaft 28 extends through a collar 32 and a block 26 and is integral with a cap or crosshead 30. The block 26 is secured to a deck or other support surface of a vehicle. A securement eye of a container supported on the deck receives the head 30 and block 26 therethrough, the relative orientations of the two parts ensuring the container cannot be raised relative to the deck or other support surface due to engagement of cap or head 30 in the eye. Operation of a tommy bar received through opening 48 in shaft 28 reorientates cap or head 30 to allow removal of the container from the support surface (and attachment of another container) assuming the same operations are conducted in relation to any other device used to provide container securement. Orientation change displaces a captive steel ball disposed in bore 36 which operates switch 40 whereby an electrical signal is generated (either on depression or elevation of the steel ball) to activate a visual or audible alarm or to operate a brake system of the vehicle.

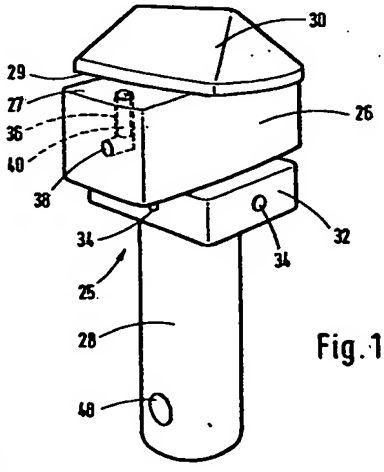

Fig. 1

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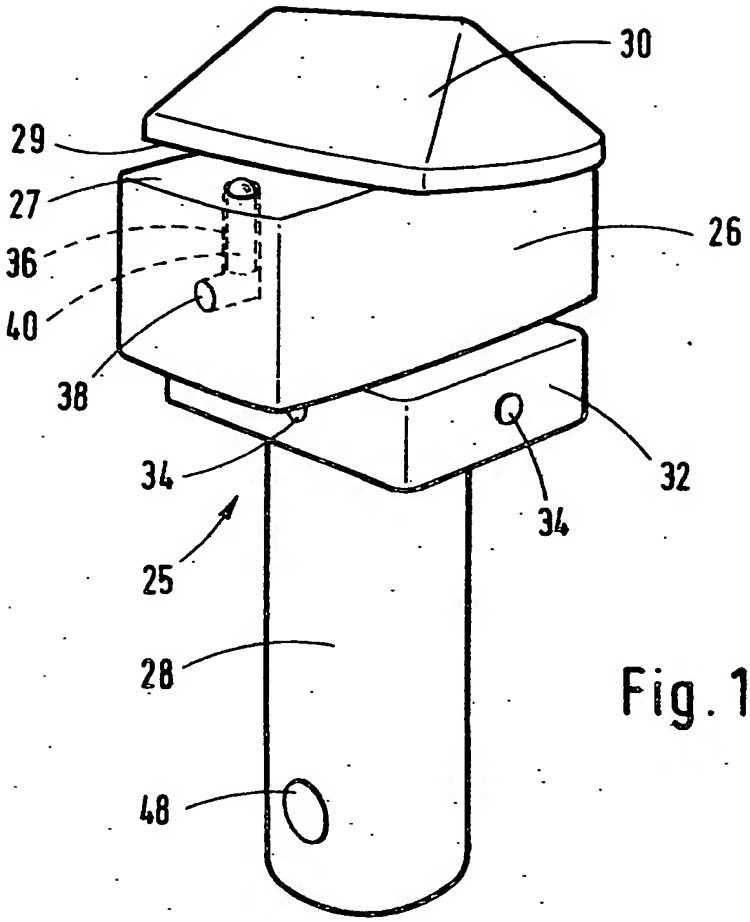

Fig. 1

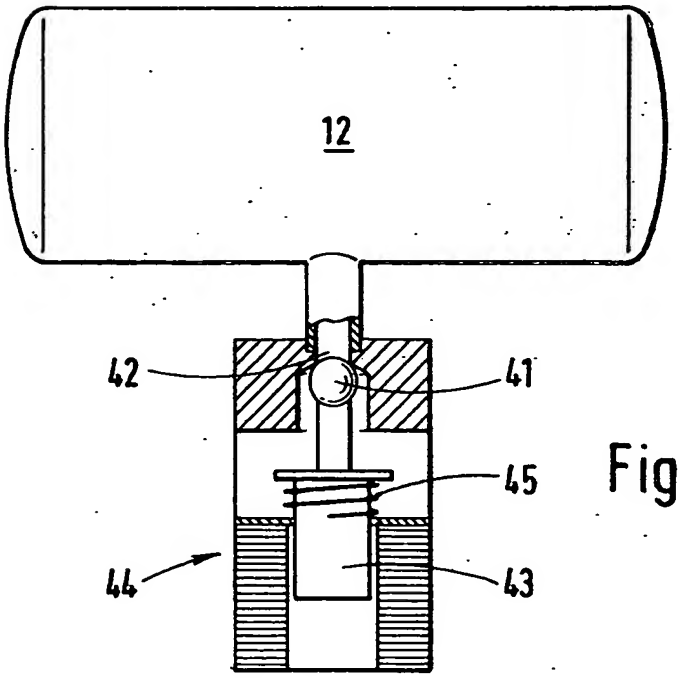

Fig. 3

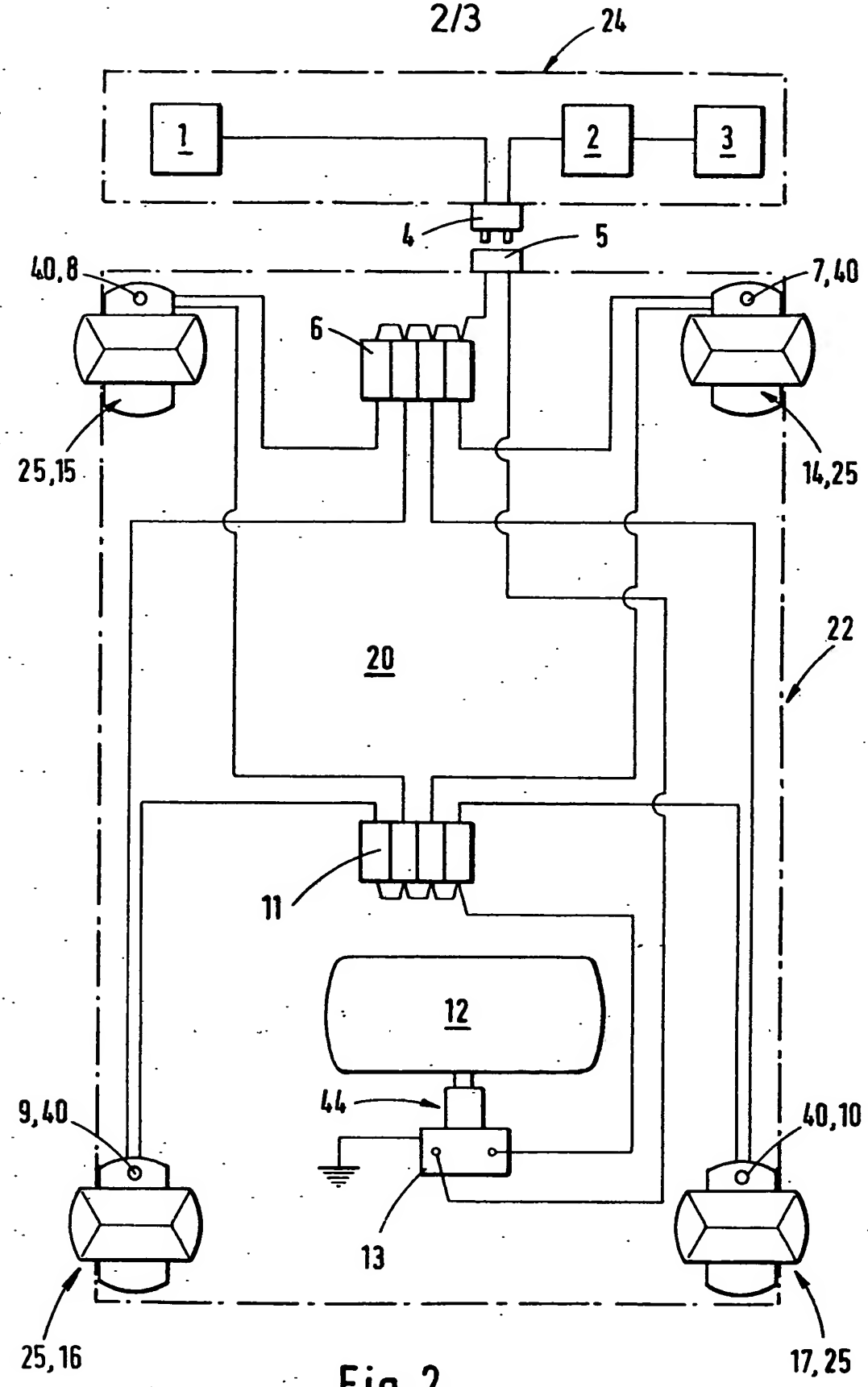

Fig. 2

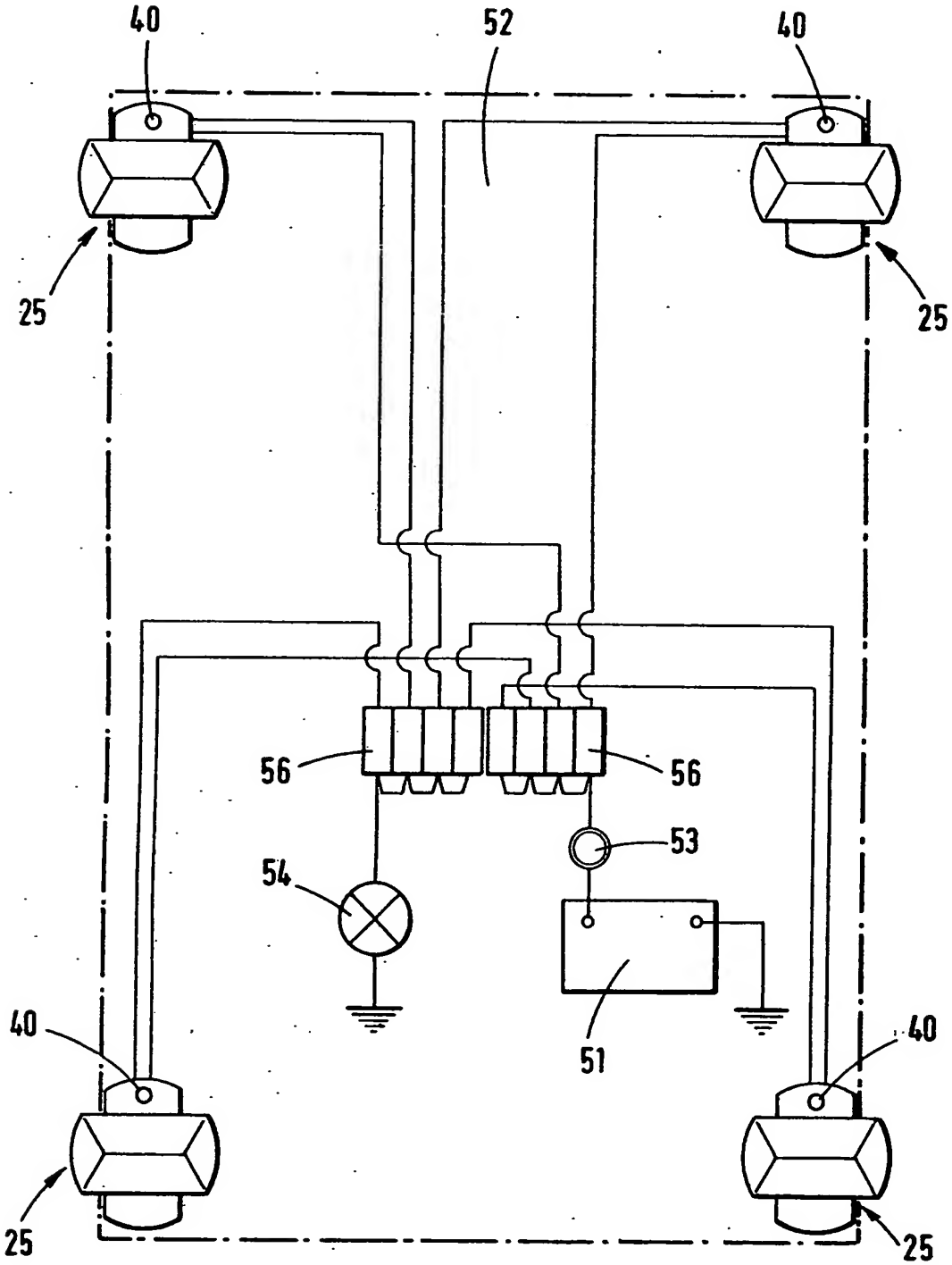

Fig.4

SPECIFICATION

Improvements in or relating to locking apparatus

This invention relates to locking apparatus and in particular to locking apparatus for securing containers, e.g. só-called ISO containers, in position on their support surfaces.

Conventionally, an ISO container is provided at its four bottom corners with horizontal plates provided with apertures or eyes. A vehicle's support surface, e.g. the deck or hold floor of a ship or the load platform of a lorry or trailer or of a railway wagon or bogie, is provided with locking devices for each such corner plate. Each locking device (hereinafter called a "twistlock") comprises a rectangular block fixed to the support surface and relatively insertable into a said plate aperture or eye, and a rotatable shaft extending through the block and provided at its upper end with a rectangular "cross-head" which in one angular position (corresponding to the open or unlocked condition of the twistlock) is likewise relatively insertable into a said plate aperture or eye and in another angular position (corresponding to the locked condition of the twistlock) overlies the periphery of the aperture or eye to prevent relative withdrawal of an inserted block.

Since the twistlocks have to be manually rotated into the locking position, e.g., by the driver of the vehicle, correct locking procedures can be forgotten or ignored. Furthermore, even when correctly performed, it is possible for vehicle vibrations and/or travel over bumpy terrain to effect a rotation of the twistlock from the locked position to the unlocked position (this being more likely where any detent mechanism provided to retain the twistlock in its set position has become loose, e.g. by wear). In either case, if one or more of the twistlocks moves to, or is left in, its unlocked position, it results in a substantial reduction in the restraint against a container falling off from the vehicle whilst in transit (which has been known to occur).

It is therefore desirable to improve the security and safety of container locking apparatus.

According to one aspect of the present invention there is provided a twistlock having a locked condition and an unlocked condition and incorporating an electric switch operable to provide an electric signal if the twistlock's condition is changed.

Preferably the twistlock is provided on a wheeled vehicle having a compressed air operated braking system, the latter including a reservoir for compressed air provided with an outlet controlled by a solenoid valve, said electric signal being supplied to the solenoid of said valve. Such an arrangement makes it possible for the vehicle brakes to be automatically applied if a twistlock is in its unlocked condition.

Advantageously, said reservoir outlet is a calibrated bleed hole providing a predetermined rate of air flow therethrough when the solenoid valve is open. This can provide for a progressive application of the brakes and avoid any sudden brake application upon a twistlock moving into its unlocked condition.

Preferably said signal is provided upon a change from the locked condition to the unlocked condition.

Conveniently, four said twistlocks are provided, one for each bottom corner of a container. Where the said signal is provided upon a change from the locked condition to the unlocked condition, the four electric switches are preferably electrically connected in parallel. If, in an alternative arrangement, said signal is provided upon a change from the unlocked condition to the locked condition, then the four electric switches are electrically connected in series.

By way of non-limiting example, embodiments of the present invention will now be described with reference to the accompanying drawings of which:

Figure 1 is a schematic perspective view of a twistlock according to this invention;

Figure 2 is a schematic representation of a tractor unit and trailer unit of an articulated road vehicle provided with a compressed air operable braking system and incorporating four of the twistlocks shown in Fig. 1;

Fig. 3 is a schematic cross-sectional view of a detail of the part of the braking system shown in Fig. 2, and

Figure 4 is a schematic representation of the load platform of a railway wagon or bogie incorporating four of the twistlocks shown in Fig. 1.

A conventional ISO container (not shown) provided at its four bottom corners with horizontal plates provided with apertures or eyes, is to be supported by and carried on the load platform 20 of an articulated lorry's trailer unit 22. The tractor unit of the articulated lorry is shown at 24. The trailer unit 22 is provided with four locking devices 25 for the four corner plates. Each locking device 25 is a so-called a "twistlock" and comprises a cast iron rectangular block 26 fixed to the support surface and relatively insertable into a said plate aperture or eye, and a cast iron rotatable shaft 28 extending through the block and provided integrally at its upper end with a rectangular cast iron "cross-head" 30 which in one angular position (corresponding to the open or unlocked condition of the twistlock) is likewise relatively insertable into a said plate aperture or eye and in another angular position (corresponding to the locked condition of the twistlock) overlies the periphery of the aperture or eye to prevent relative withdrawal of an inserted block. A substantially square, cast iron unit 32 is retained immediately beneath and in surfacial contact with the block 26 by means of a circlip (not shown), the unit 32 providing a collar for the shaft 28. The unit 32 is provided with two bores 34 at right angles to one another. A detent mechanism is provided between the shaft 28 and the unit 32, this detent mechanism comprising a steel ball urged resiliently away from the shaft against the inner surface of collar unit 32 and for cooperating engagement, selectively, with the inner end of one or other of the two bores 34.

When one of the bores 34 is thus engaged by the detent, the "cross-head" 30 is directed longitudinally and co-directionally with the longitudinal direction of the block 26. Preferably, the dimensions of the two

The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

parts 26,30 are such that in this position—which corresponds to the open or unlocked condition of the twistlock—the two parts are coextensive with one another (when seen in plan view) so as to facilitate passage of the container's apertured bottom plate over both these two parts. When the other bore 34 is engaged by the detent, the "cross-head" 30 is directed as shown in Fig. 1 to extend eccentrically with respect to the block 26, with its longer dimension at right-angles to the longer dimension of block 26 and of an extent such as to straddle across both longer sides of the rectangular aperture in the container's bottom horizontal plate. This latter position corresponds to the locked condition of the twistlock.

A cross-bore 48 is provided at the lower end of the shaft 28 of each twistlock 25 into which a tommy-bar (not shown) can be inserted for facilitating rotation of the shaft to change the twistlock's condition from locked to unlocked or vice versa.

In accordance with the present invention each twistlock 25 is provided with an electric switch to provide a signal as the twistlock's condition is changed. To this end, the block 26 of each twistlock 25 is drilled to provide a vertical bore 36 extending downwardly from its upper surface 27 and communicating with a horizontal lateral bore 38. An electric switch 40 is inserted in vertical bore 36. The electrical leads for the switch extend outwards through the lateral bore 38. An operating member, e.g. a spring-loaded captive steel ball, is provided for the switch 40, this operating member protruding out of the vertical bore, i.e. projecting above the surface 27, so as to be engageable by the "cross-head" 30 (or at least the underneath surface 29 thereof) when the latter is rotated from the position shown in Fig. 1 to the position it adopts when the twistlock is in its open or unlocked condition, and thus effect operation of the switch.

In Fig. 2, the four twistlocks (25) are referenced 14,15,16,17 and their electric switches (40) are referenced respectively 7,8,9,10. Each of these switches has one terminal connected to the vehicle ignition 1 (located in the tractor unit 24) through a plug and socket connection 4,5 and a wiring connection block 6. The other terminal of each switch 7-10 is connected via a wiring connection block 11 to one end of the solenoid 13 of a solenoid valve 44. As shown in Fig. 3, the solenoid valve 44 comprises an armature rod 43 provided with a rubber sealing ball 41 that seats against and controls a calibrated bleed outlet hole 42 from a compressed air reservoir 12 of the vehicle's braking system. The other end of the solenoid 13 is electrically connected via plug and socket 4,5 to series-connected visual and audible warning devices 2,3 (e.g. a light bulb and a buzzer), fitted to the dashboard in the driver's cab on the tractor unit 24.

In use, if any one of the twistlocks 14-17 is moved from its locking condition to its open condition (in which a container could become disengaged therefrom), the associated "cross-head" 30 will operate the switch 40 associated therewith (i.e. one of the switches 7-10). If at that time the ignition 1 is on, a live circuit will be completed whereby the warning devices 2,3 and the solenoid 13 will be operated. This last will lift the sealing ball 41 off its seating on bleed hole 42 against the action of the valve-closing spring 45. By appropriate calibration of the bleed hole 42, the rate of air flow therethrough can be set to provide a predetermined time lapse before the brakes are automatically operated. This ensures the vehicle cannot be driven until each of the twistlocks 25 (or 14-17) is manually turned to be in its locking condition.

It will be noted that the visual and audible warning devices 2,3 are activated as soon as the circuit of Fig. 2 is closed and goes live (by closure of the ignition switch 1 and any one of the twistlock switches 7-10). However, application of the brakes only occurs after elapse of a delay period. This provides an additional safety measure in the event that a twistlock switch is closed whilst the vehicle is in motion since any unexpected sudden brake application could be dangerous. It will also be appreciated that in normal use, i.e. with all the twistlocks in locked condition, the circuit of Fig. 2 is non-live whereby the solenoid is unergised. Accordingly any tendency for the solenoid to burn out is minimised.

Conveniently, the solenoid employed may be of the kind used for a vehicle starter motor. Advantageously, the bleed hole to the reservoir may replace the usual drain tap provided at the reservoir bottom.

It will be further appreciated that the above-described embodiment of this invention is also suitable for other vehicles, e.g. fixed-platform lorries, ships, railway wagons or bogies, and so on, as well as the articulated lorries described. Furthermore, the arrangement may be simplified and not involve automatic application of the brakes but, for example, merely provide a warning signal (be it audible and/or visual). In such a case, the circuit could be modified such that the switches 7-10 were electrically connected in series with one another (rather than in parallel as in Fig. 2) and also in series with the ignition switch 1 whereby the vehicle cannot be started if any one of the twistlocks is in its open or unlocked condition.

For example, in the embodiment of Fig. 4 four twistlocks 25 are mounted at the appropriate corner locations of the platform 52 of a railway wagon or bogie unit. The four electrical switches 40 of the twistlocks 25 are connected in series via one or more connection blocks 56. A battery 51 is mounted on the wagon, e.g. to the underside of its load platform 52, and is connected to one end of the series of twistlock switches 40. The other end of the series of twistlock switches 40 is connected to an audible (or visual) alarm device 54. The latter may be mounted on the railway wagon, to provide a totally self-contained system. Alternatively, device 54 may be a connector for coupling to a separate alarm device located in the cab of the railway traction unit and serving for several similar railway wagons.

Such an arrangement is permanently "live". To avoid this the battery 51 may be connected to said one end of the series-connected switches 40 via a key-operable electrical switch 53. The key-operable switch 53 is also mounted on the wagon's load platform 52, and may conveniently be of the "semi-captive" type which only permits removal of the key when (i.e. after) the switch 53 is turned ON by the key and otherwise retains the key captive in the switch 53.

CLAIMS

1. A twistlock having a locked condition and an unlocked condition and incorporating an electric switch operable to provide an electric signal if the twistlock's condition is changed.

2. A twistlock according to Claim 1 mounted on a load supporting platform for an ISO container, the said electric switch being connected to an alarm device responsive to the application or removal of said electric signal.

3. A twistlock according to Claim 1 or Claim 2, wherein said twistlock is provided on a wheeled vehicle having a compressed air operated braking system, the latter including a reservoir for compressed air provided with an outlet controlled by a solenoid valve, said electric signal being supplied to the solenoid of said valve.

4. A twistlock according to Claim 3, wherein said reservoir outlet is a calibrated bleed hole providing a predetermined rate of air flow therethrough when the solenoid valve is open.

5. A twistlock according to any preceding Claim wherein said signal is provided upon a change from the locked condition to the unlocked condition.

6. A twistlock substantially as herein described with reference to and/or as illustrated in Figure 1 of the accompanying drawings.

7. Four twistlocks each according to any preceding Claim and located one for each bottom corner of a container.

8. Four twistlocks according to Claim 7 when dependant from Claim 5, wherein the four electric switches are electrically connected in parallel.

9. Four twistlocks according to Claim 7, wherein said signal is provided upon a change from the unlocked condition to the locked condition, the said four electric switches being electrically connected in series.

10. A load platform to support an ISO container, said platform being provided with container locking equipment substantially as herein described with reference to and/or as illustrated in the accompanying drawings.

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